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ABSTRACT

An overview is provided of the relevant concepts from Total Quality Management (TQM), fuzzy logic, and the chaos theory of education in an effort to support the case for student success courses. First, the paper discusses student success courses, which emphasize helping students develop the skills needed to identify, create, and pursue an increased variety of options in their lives, as well as teaching academic and life management skills and providing information about the school and the community. Next, the reviews current thinking on fuzzy logic (an attempt to bridge the gap between scientific logic and ordinary logic), concluding that a wide range of factors can have a direct impact on learning outcomes, including empowerment and such personal qualities as motivation, commitment, and tenacity. The next section summarizes the major contributions that TQM and Total Quality Improvement (TQI) can make to the discussion of student success, drawing parallels between the business world and education. Learning is discussed as an on-going process that lends itself to the principles of TQM/TQI, and prerequisites for applying these principles in education are identified. Hidden factors that limit student success are enumerated, and their relationship to locus of control is discussed. Next, the chaos theory of education is discussed, suggesting that effective new processes do not need to be clearly understood or based on traditional beliefs to yield consistent outcomes. Finally, a paradigm for developing independent learning skills is presented. (MAB)

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TEACHING AND LEARNING IN A STUDENT SUCCESS COURSE: A DISCUSSION CONCERNING THE DEVELOPMENT OF THE INTERNAL LOCUS OF CONTROL USING FUZZY LOGIC, TQM, AND THE CHAOS THEORY OF EDUCATION

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Presented at

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PREFACE

This paper is not intended to be a definitive discussion of the pros and cons of applying TQM, fuzzy logic, or the chaos theory to solve problems in education. Rather, the major purpose is to use TQM, fuzzy logic and the chaos theory to assist others in getting a better understanding of both the process and the dynamics of student success courses. In this discussion new and novel ideas and concepts from business, industry and science have been borrowed in an effort to state as clearly as possible the case in support of student success courses. On close scrutiny, there appears to be an amazing number of parallels between the introduction of TQM in American business and industry and the introduction of student success courses in higher education. Perhaps we educators can benefit from the experience of others in introducing TQM.

Another reason for writing this paper is to initiate a discussion about how the process, and the dynamics of success courses impacts on educational outcomes. All of these factors need to be more clearly understood. To help us better understand the unique learning process, student success courses need to come under far greater scrutiny and study by educational researchers and theorists. Given our experience with these courses, we are confident that close scrutiny by others will result in added support for this systematic approach to developing the internal locus of control in students. Our fondest hope is that as a result of this heightened interest and study, many more students will have the opportunity to experience the challenge, excitement and benefits from enrolling in a student success course.

One of the unique features of student success courses is that such a broad cross-section of students can benefit from taking them. Although almost all students can benefit, in practice, the course is frequently tailored to the needs of specific groups of students, ranging from honor students to all entering freshmen. Student success courses, as discussed in this paper, do not include remedial courses. Course content generally includes academic skills, life management skills, and information about the school, and the community. A major emphasis of the course is on helping students develop the skills needed to identify, create and pursue an increased variety of options in their lives.

While student success courses are not the panacea for all the ills of higher education, they are among the most promising, for two reasons. First, they have the potential to have a dramatic impact on the performance of a broad spectrum of students. Secondly, because they typically address the internal locus of control, even students with limited buy-in can benefit from taking the course. In the class, students are encouraged to make a commitment to earning a quality education. At the same time, they are asked to be honest with themselves about their reasons for being in school, without guilt, blame or shame. Thus, even those who hesitate and don't/can't make a commitment to earning a quality education, have an opportunity to gain valuable insight into their own values and behavior. Although not all benefit equally, the benefits students receive are directly related to their level of commitment.

Because such a wide range of student needs can be addressed in the course, it is difficult, if not impossible, to determine exactly how student success courses affect the performance of any given student. However, based on anonymous course evaluations, anecdotal reports from students, and educational outcome data, there is little doubt important attitudinal and behavioral changes occur in these courses which in turn have a dramatic impact on academic success.

By their very nature, many of the empowering features of student success courses are difficult to identify or measure. This is true because many of these factors are in the affective domain or frequently result in subtle or delayed benefits. This makes conducting a scientific study of these courses very challenging. The multi-faceted, synergistic approach used to empower students to be successful, which is so typical of student success courses, is more easily understood in the context of Bart Kosko's theory of fuzzy logic.

Fuzzy logic is an attempt to bridge the gap between scientific thought and ordinary thought. The truth is, most complex ideas are based on concepts that <u>are</u> a little fuzzy rather than on simple, factual information. Take education for example. Not just one, but a multiplicity of factors contribute to academic success or failure.

Thus, when examining the learning process, instead of the traditional approach looking at precise, clear-cut, unequivocal data such as standard test scores, IQ, and GPA, a much broader approach is needed. The reason is simple. While factors that rely on hard data are useful and convenient in measuring educational outcomes, they offer little in understanding why, when looking at the performance of students with similar scores, some flunk out and others graduate with honors. If we are going to make progress in improving educational outcomes, we need to devise new ways to conceptualize, examine, and support the learning process.

Historically, educational research has relied heavily on data that comes from the cognitive domain to predict academic success, e.g. GPA and test scores. However, these factors have definite limitations. A key limitation of hard data is that it is generated from an external locus of control and therefore does not take into consideration any factors related to the affective domain or the internal locus of control of the learner. They neither take into account how the affective domain impacts the learning process, nor shed light on understanding how changes in the internal locus of control can result in improved academic performance. In contrast, fuzzy logic suggests that a wide range of things can have a direct impact on learning outcomes. This broader, more holistic view, takes into account a host of more subjective factors including empowerment, systematic guidance, and such personal qualities as motivation, commitment, and tenacity-- none of which are easily accounted for via scientific observation.

Total Quality Management (TQM) and Total Quality Improvement (TQI) have created a revolution in business and industry by emphasizing the use of ""fuzzy"" processes to create outcomes which are measured via hard statistical data. Total Quality Improvement also provides a structure, language and a systematic way of conceptualizing some of the hard-to-communicate ideas related to improving learning via a student success course. Although many of the principles of TQM/TQI were well known in this country before the 1970's, implementation was haphazard and thought to be too costly. Consequently, there was almost universal indifference toward Total Quality in the USA. Finally, after years of decreasing market share, U.S. industry came to realize what was common knowledge to the average American shopper: international competition in the electronics, machine tool, photographic and auto industries was winning over the American consumer. In the few short years since TQM was first embraced in the U.S., there has been dramatic improvement in quality of products and services of companies and government agencies that have made a commitment to quality improvement. Total Quality Improvement and Total Quality Management emphasize customer satisfaction and constant improvement. A key concept is they both depend on developing the internal locus of control of the workers. This is accomplished by empowering those who are going to do the work, giving them the responsibility to

decide how mutually agreed-upon goals are going to be reached. Although the goal of improving quality is a constant, the commitment to quality will require the systematic application of one or more specific process(es) rather than the blind adherence to a fixed set of rules or regulations. Thus, implementing the empowerment process shifts responsibility and decision making to the people directly involved in accomplishing the mission and goals, in a word, production. When people are empowered, they show more ownership and assume more personal responsibility for reaching mutually agreed-upon goals. For empowerment to work, two basic ingredients are needed: trust and a training plan that insures: the successful acquisition of knowledge and an opportunity to develop the needed skills. These ingredients are commonly found in student success courses. Feedback from students indicates that when the empowerment process is applied in education, things begin to change. Students not only become more involved in their education, but they also assume a more active and responsible roles in other areas of their lives as well.

The importance of the empowerment process is revealed in the history of TQM in the U.S. Just fifteen years ago, the standard operating procedure embraced by labor and industry was both work and work outcomes were supervised and controlled by management using mandates, quotas, rules and regulations. Labor and industry played adversarial roles - cooperation and personal responsibility for improving things was not expected or forthcoming from the workers. Thus, even early attempts to implement parts of TQM, like quality circles, were unsuccessful. Not until the entire TQM philosophy was introduced and workers were empowered and given the responsibility to improve processes did quality improve.

Learning is a good example of another on-going process that lends itself to many of the principles of TQM/TQI. Applying these concepts to learning requires:

- a commitment to quality education as a mutually agreed-upon goal.
- a guided experience that enables students to initiate and develop independent learning skills.
- the reduction of fear and an increase in trust through sharing and mutual respect.
- a well defined structure that enables the teacher to give up some control and shift more responsibility for learning onto the student.
- implementation of the "just in time"(JIT) principle to the information, ideas, and techniques needed by students.
- the creation of study groups and teams via various cooperative learning activities and schemes.
- regular and systematic feedback.

In applying the principles of TQM/TQI, and fuzzy logic, often seemingly unrelated factors have to be addressed before the desired improvements can be realized. For example, W. Edwards Deming, the quality guru, identifies fear as the number one enemy of change and believes that little real change can occur unless fear is greatly deminished or eliminated. In education, fear is also present and creates similar problems. There are at least five kinds of fear that limit student success: fear of the unknown, fear of failure, fear of rejection by other students or friends or family, fear of authority figures, and fear of success. Some experts theorize that fear is the number one reason why students drop out during their first semester. Although Deming's ideas about fear fall into the realm of fuzzy logic, being aware of the negative impact of fear and taking steps to help students overcome their fear plays a valuable role in improving student success. In contrast, ignoring, or being unaware of the negative impact of fear, perpetuates a climate in which optimum learning outcomes are not likely to occur.

Using other fuzzy ideas, Deming goes on to identify a total of fourteen points that need to be addressed in this country, to maximize total quality improvement. Most of these factors are related to the development of the internal locus of control of the workers. Demning maintains that failure to address these factors has a stifling impact on quality improvement. In a similar fashion, there are a group of limiting factors in education. Through observations, anecdotal reports, and collaboration with other faculty, the following factors that limit student success have been identified:

Thirteen Hidden Factors That Limit Student Success

1. Low self-esteem and/or diminished sense of self-worth.
2. A history of passive learning.
3. No clear educational or career goals.
4. Overwhelming complexities and choices.
5. Alienation from the dominant culture.
6. Lack of information about and/or understanding of options in higher education.
7. Little practice in decision-making and goal-setting.
8. Lack of experience in time/task management or organizing for success
9. Inexperience in sustaining a commitment to academic excellence.
10. Difficulty in making and following through on commitments.
11. No development of a support network for self or participation in a support group for others.
12. Peer pressure against putting in the time and effort required for learning.
13. Lack of depth and breadth in life experiences.

Like Deming's fourteen points, all thirteen of these fuzzy factors are related to the internal locus of control. Thus, applying Kosko's fuzzy logic to learning, when we educators fail to address these factors, the potential for optimum student achievement is greatly reduced.

The implementation of the TQM/TQI process produces predictable changes in attitude and behavior of those involved. Whether in business, industry, or education, when the principles of TQM/TQI are applied, participants who make a commitment to quality will likely:

- become more personally involved
- assume more responsibility
- increase both the quantity and quality of communication
- develop a greater sense of community
- show signs of enhanced self-esteem
- identify and seek out needed skills

Perhaps the most significant change that can be predicted is a noticeable shift in the locus of control. Rather than looking to external factors for answers, workers and students alike are more likely to ask, "What can I do to improve my performance." This shift clearly defines the power and importance of the internal locus of control and establishes a direct relationship to the empowerment process.

To date, few attempts have been made to design and implement a systematic approach to the development of the internal locus of control in the classroom. However the TQM/TQI process provides a promising model for the development of the internal locus of control in students. Unfortunately, it has received little attention to date in American higher education. In contrast, the emphasis in trying to improve higher education over the last ten years has been in two areas: improving teaching and efforts to legislate educational improvement via assessment, placement and improved access. While few would argue with the intent, some quality experts would point out that continuing to emphasize the importance of the external locus of control actually sends the wrong message by not helping students understand that they, not external factors, hold the key to improving educational outcomes. They would likely go on to point out that it is doubtful the breakthrough improvements in educational outcomes will come about without specific steps to empower a broad cross-section of students to become more effective and efficient learners.

While collaborative and cooperative learning schemes, coupled with efforts to improve teaching, are steps in the right direction, they fail to have their optimum impact on learning outcomes because they represent more of a "quick fix" than an attempt to introduce a basic change in philosophy regarding learning. This

approach parallels early unsuccessful attempts to launch quality circles in the auto industry. In both cases, potential improvements were limited when there were no mutually agreed-upon goals or all out efforts made to empower those who were going to do the work.

Deming's fourteen points identify the hidden factors that limit quality in business and industry. His premise is, improvement can best be brought about by paying attention to the customers needs and empowering workers to make the decisions needed to support continuous improvements to meet those needs. Once this is accomplished, and mutually agreed-upon goals are established, a process (the Shuhart cycle) for continuous improvement can be undertaken. This approach consistently results in much better outcomes than improvement through innovation alone. The initial benefits that accompany innovations rapidly erode without an on-going commitment to continuous improvement.

This leads to another interesting parallel in education. Basically, educational improvement can be classified into two approaches: improvement via innovation (e.g. mandates and teacher training) which represents the external locus of control, and improving students' ability to learn via empowerment, which represents the internal locus of control. Educational mandates are like trying to legislate happiness. While few are against the idea, happiness, like learning, is an on-going process that requires the active involvement of those concerned and can not be legislated by others.

In contrast, empowerment is about giving up control, and sharing responsibility; difficult ideas for many educators to accept. While few would argue that teaching is unimportant, some instructors believe that what they teach is more important than what students learn. While improved teaching and educational mandates will likely have a positive impact on the quality of education, optimum improvements can only come about by a concerted effort to empower a broader cross-section of students to assume the primary responsibility for their own education. Coupled with this is the need for teachers to reduce, eliminate, or overcome the hidden factors that prevent students from developing their full potential. Unfortunately, in spite of the growth of student success classes over the last ten years, there has not been an all-out effort to shift more responsibility for learning to the student, empower students or eliminate the "hidden" factors that limit student success.

In summarizing TQM/TQI's contributions to this discussion, they provide the language, terminology, a conceptual framework, and a model which can be used to improve educational outcomes, just as they have done in business and industry. TQM/TQI terminology helps us better understand why student success courses have such a powerful impact on learning. It also helps us communicate more

effectively some of the more subjective, "fuzzy" parts of student success courses. Although fuzzy ideas like those embraced by TQM/TQI have not yet made their way into the educational mainstream, the fact is many TQM/TQI principles have already been applied in student success courses with encouraging results.

The difficulty of trying to understand and communicate what goes on in a student success course is not unique. Neither is the systematic avoidance of new ideas. This leads us to a discussion of another new idea, the chaos theory of education which is modeled after the chaos theory of physics. Scientists have long pondered the problem of understanding and accounting for random, unexplainable events in science. Historically, these events presented a problem because they did not conform to the known laws of nature. Thus, many spontaneous and seemingly random events, such as the appearance of ripples on moving water, have gone unexamined because scientists could not explain how or why they occurred. For this reason, many previously unstudied scientific phenomena went unexplored until recently, when scientists developed the "chaos" theory of physics. This was brought about by the astonishing discovery that even fuzzy events and ideas that are not clearly understood can result in predictable outcomes. This breakthrough was made possible by taking a new approach to a problem long ignored.

Using the chaos theory of physics as a model, the chaos theory of education suggests effective new processes do not need to be clearly understood or based on traditional beliefs to yield consistent outcomes. The application of the chaos theory of education provides a rational for understanding why so little time and effort have been devoted to the study of both the processes and the outcomes related to student success courses. These courses should not be ignored simply because they use new and different approaches to achieve statistically significant improvements in educational outcomes. Like the chaos events in physics, these outcomes occur in spite of the fact that the process is not clearly understood. For these reasons student success courses certainly deserve more scrutiny and attention than has been given thus far.

The following case illustrates the need for more study. In higher education, especially in open-door admission colleges, many students -even some of the bright students who did well in high school- have not learned how to study effectively, and live unfocused, undisciplined and/or fragmented (failing) academic lives. Like the unstudied "chaos" events in science, educators have largely ignored addressing factors like these for two reasons. First, because they are difficult to study and second, they do not conform to the more easily managed and more widely accepted theories concerning the dominant role the cognitive domain plays in determining academic outcomes.

Ironically, these reasons parallel the ones scientists have historically given for not studying "chaos" events in science. Student success courses are difficult to understand and talk about because they use an unorthodox approach to enhance educational outcomes. The application of fuzzy logic and the principles of TQM/TQI are tools that help us understand and talk more effectively about the process used to empower students to be more responsible for learning.
There may be other reasons for the lack of a broader base of support for student success courses. Research universities, because of their selective admission standards, are less likely to have a comprehensive student success course. For example, most Freshman Seminar classes spend little time or effort in developing academic skills. Hence, many educational researchers, by virtue of their own history, educational experience or personal values, may have difficulty understanding and/or accepting the need for, and value of student success courses. Many of them believe that only those who are fully prepared should attend college. Those who hold such a view, typically do so under the guise of "upholding academic standards". The inference seems to be that academic excellence and student success courses are incongruent ideas. It is probable one or more of these factors have contributed to the development of a restricted view of the value and importance of student success courses. This in turn contributes to discounting or ignoring the need for, or value of non-traditional approaches to learning such as student success courses. Given the national dropout rate for beginning students at all levels of higher education, this position needs to be reexamined. Whatever the reasons, the fact remains, research institutions have paid little attention to studying the process, impact or potential of these courses. At this time, only a small handful of universities have conducted research on student success courses. Most notable is the work done by the University of South Carolina.

Paradoxically, the institutions of higher education most likely to have a student success course, are the ones least likely to have the financial resources, or the expertise needed to conduct extensive educational research. In spite of this, there is growing evidence that the greatest potential for improving educational quality lies in helping students develop their internal locus of control and emphasizing the importance of the affective domain in learning via a student success course. Given the promise suggested by the emerging student success course research, such evidence would not be ignored for long in business, or industry. Perhaps Machiavelli, in 1513 AD., had it right:

> "There is nothing more difficult to carry out, nor more doubtful of success, nor more dangerous to handle, than to initiate a new order of things.
>
> For the reformer has enemies in all who profit by the old order, and only luke-warm defenders in all those who profit by the new order.

> The luke-warmness arises partly from fear of their adversaries who have law in their favor, and partly from the incredulity of mankind, who do not truly believe in anything new until they experience it."

Therein lies a problem. It is likely the full potential of student success courses will only be realized by the re-allocation of existing resources. In order for this to occur, both the process and the benefits need to be more clearly understood and documented. Therefore, given the meager, but promising research currently available, there is a compelling need for more research into understanding the educational outcomes related to student success courses.

In our eagerness to share our experience with others, another important lesson has been learned. The potential for empowering students to be successful is not limited to student success courses! Based on our experience in enhancing student performance via a student success course, a series of two-day staff development workshops for faculty across the curriculum has been developed and initiated. These workshops use the thirteen factors listed on page 6 as the major focus and are built around the following student-centered paradigm for developing independent learning skills:

The Paradigm for Developing Independent Learning Skills

1. Develop ways to skillfully and systematically shift the primary responsibility for learning to the student in a gradual and carefully structured way.

2. Redefine your role as a faculty member by taking on more of the role of "facilitator of learning activities". Develop and use academic coaching skills.

3. Learn and use effective ways of enhancing self-esteem in the classroom.

This two-day workshop, entitled The Right To Succeed, demonstrates the transferability and broad application of these newly emerging learning technologies to classrooms across the curriculum. Over the last three years, five hundred faculty, from over fifty schools and colleges, have taken this training. The results have been gratifying and demonstrate that faculty from across the curriculum are interested in learning and have been effective in applying these new educational technologies.

We are only in the pioneering stages of understanding and developing ways faculty from across the curriculum can play a more active role in empowering students to take charge of their academic lives. The technology that enables us to

do this is still being developed and deserves more serious attention than has been given to date. We are encouraged, however, by the enthusiastic feedback we have received from both experienced and new faculty who have completed this 2-day workshop. Realizing the importance of empowering students is an important first step in improving learning outcomes. Implementing these techniques and measuring the educational outcomes are logical next steps. Additional work needs to be done to broaden our understanding of both the process for empowering students, and the resulting enhancement of educational outcomes. There is still much work to be done in this fertile area of educational research and development.

Who has the primary responsibility for learning? Students do. Linked with this responsibility is their right to succeed. Before many can claim this right, they need help in developing their ability to learn. This assistance can be given either in a specially designed student success course and/or by specially trained faculty in classrooms across the curriculum. Probably, the most effective way would be to combine these two approaches. In doing so, ideas, strategies, and techniques students learn initially in a student success course their first semester, would be reinforced in classrooms across the curriculum.

The results of research on student success courses and feedback from faculty who have attended a Right To Succeed Workshop, strongly suggests learning outcomes are enhanced when students develop independent learning skills, and faculty plays a key role in systematically guiding and empowering students to lead more focused and committed lives.

Perhaps the most promising idea in education today is the systematic application of the principles of TQI to the learning process. Not only do we need to do everything we can to insure student access to student success courses, we also need to make an all out effort to reduce or eliminate the non-cognitive factors that limit academic success.

For more information contact Dr. Ed Stupka, Counselor, Sacramento City College, 3835 Forepart Blvd., Sacramento, Ca 95822 or phone (916) 558-2231.

GLOSSARY OF TERMS

The following terms are listed in alphabetical order as a quick reference to some of the jargon used in this paper.

1. Chaos theory of education
The chaos theory of education is modeled after the chaos theory of physics. This theory came into being when scientists discovered that random, unexplainable phenomena which had long been ignored as "chaos" events began to yield useful data when they were studied over a long enough period of time. Based on the research data available, the chaos theory of education suggests that even though Student success courses have not been studied extensively, they can no longer be ignored because the growing body of evidence suggests that they use new and different approaches to improve educational outcomes, which frequently are statistically significant.

2. Educational outcomes
Educational outcomes include GPA, credit hours completed, persistence rate, and dropout rate. All of these factors can be easily measured and are frequently compiled at given intervals of time.

3. Empowerment
Empowerment refers to the initiation of an ongoing process, that includes shifting power and responsibility to those who are going to do the work needed to accomplish mutually agreed-upon goals.

4. Fuzzy logic
Fuzzy logic is an attempt to bridge the gap between scientific logic and ordinary logic. Fuzzy logic suggests that a wide range of things can have a direct impact on learning outcomes. Included in fuzzy logic is a number of more subjective factors such as empowerment, and such personal qualities as, motivation, commitment, and tenacity.

5. Independent learner
This term refers to a self-actualized student who has developed the ideas, skills, strategies, and techniques needed to learn effectively with little or no assistance from teachers.

6. Just in time (JIT) This is a phrase from TQM that refers to providing what ever is needed to complete a task just in time to be used most effectively. No large stocks are maintained.

7. Learning
Learning is an active mental or physical process engaged in by individuals. The goal of learning is to acquire and be able to use effectively more facts knowledge, information, or skill.

8. Locus of control
This refers to the factor(s) that determine or control what a person does or does not do, perceive or experience. Generally, a strong internal locus of control coincides with high self-esteem.

Our internal locus of control is functioning with in each one of us to the extent we knowingly choose our perceptions and actions.

The external locus of control is functioning when our perceptions, thoughts or behaviors are focused on external factors such as imposed goals or regulations.

9. Mutually agreed-upon goals
This refers to a clearly defined goal that is agreed to by both the learner and the teacher. Attaining this goal usually requires commitment, time, skills, tenacity and the cooperative effort of both parties.

10. Responsibility
Responsibility refers to the ability to respond in an appropriate and timely fashion.

11. Synergistic outcomes
This phrase refers to the multifaceted, positive outcomes that go beyond the expected results.

12. Teaching
Teaching is what teachers do when they are attempting to assist students in learning.

13. TQM/TQI
TQM is a management philosophy focuses on leadership and is built around many concepts some of which are fuzzy in nature: (1) customer satisfaction (2) increasing involvement, (3) letting go of power/sharing responsibility, (4) building two-way accountability, and (5) setting mutually agreed upon goals. All of these fuzzy characteristics are related to the locus of control. TQI is similar not so related to management, and embraces another fuzzy idea- a commitment to continually improve the quality of everything done by the people doing it.

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